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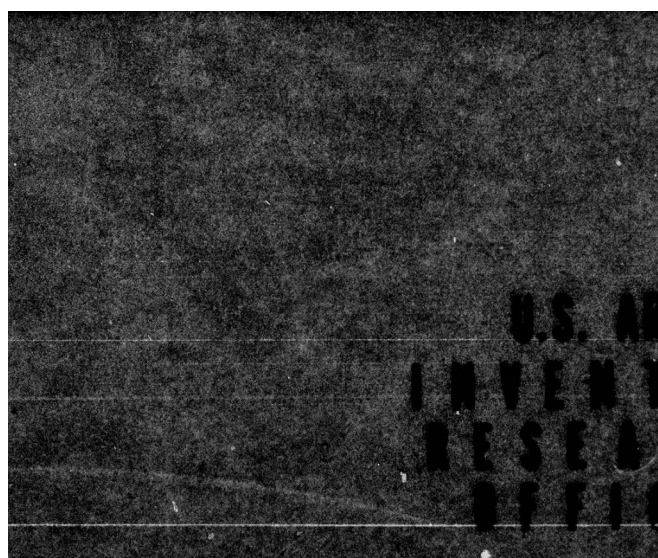
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19. KEY WORDS (Continue on reverse side if necessary and identify by block number)		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report describes work done by the US Army Inventory Research Office during the period July 1976 - 30 September 1977. Reports published during the period are listed, along with papers presented at professional meetings and notes on other professional activities.		

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US ARMY INVENTORY RESEARCH OFFICE

OVERVIEW

This report covers IRO activities in Fiscal Years 7T and 1977, July 1976 through September 1977. Annual Reports covering previous years go back to FY 1966.

Eleven projects were completed during FY 7T and 1977. Eight projects were in process as of 30 September 1977 and have been carried over into FY 1978.

Two projects on which work had been done in FY 1976 were carried over into FY 1977 but remained in almost a suspended status during the entire period. This inactivity was caused by an influx of higher priority projects during FY 1977 and by the loss of an analyst space due to manpower cut-backs. The projects in question are:

IRO Project 213 - Implementation of Logistic Performance Indicators

IRO Project 229 - Measurement and Implications of Production Lead Time Variability

Work on these projects is scheduled to resume during the 2nd quarter, FY 1978.

As mentioned, the personnel strength of the IRO was reduced by one during FY 1977 with the resignation of Richard Urbach in March 1977. Authority to fill this vacancy could not be obtained and the space was permanently withdrawn.

The summer program continued. Mr. James Fowler, a University of Pittsburgh graduate, worked in the office from June through September 1977.

A fact not reported in the previous Annual Report but nonetheless important concerned the IRO's physical move, which took place in May 1976. The move to the present address was occasioned by the then imminent closing of Frankford Arsenal, which has since taken place.

**US ARMY INVENTORY RESEARCH OFFICE
COMPLETED STUDY SUMMARY**

TITLE: Evaluation of Provisioning Techniques

IDENTIFICATION NUMBER:
IRO Project No. 217

REPORTS:

"New Concepts for Provisioning Parameter Estimates: Part I: Maintenance Factors and Replacement Rates," Donald A. Orr, IRO Technical Report, December 1976, AD-A034589.

"New Concepts for Provisioning Parameter Estimates: Part II: Task Distributions and Washout Rates," Donald A. Orr, December 1976, AD-A034585.

SPONSOR:

DRC Directorate for Materiel Management
Associate Director for Maintenance, DRCMM-M

PROJECT OFFICER:

Dr. Donald A. Orr

INITIATION/COMPLETION DATES:

March 1974/December 1976

ABSTRACT:

Provisioning policies, procedures and techniques have been extensively revised in recent years. IRO has been assigned the task of assessing the current effectiveness of the provision process used by DARCOM.

The reports include summaries and assessments of current practices. Several promising techniques of initially estimating and subsequently updating maintenance factors, replacement and repair task distribution and washout rates are described.

MAJOR CONCLUSIONS/RECOMMENDATIONS:

The suggested techniques for provisioning parameter estimates are recommended to be reviewed by Materiel Readiness Commands and to be applied on an ad hoc case basis on future systems. Several spinoff projects for further development of estimates are posed.

IMPLEMENTATION STATUS:

Several of the maintenance factor techniques are to be further refined in planned IRO studies.

RELATED STUDIES:

None.

US ARMY INVENTORY RESEARCH OFFICE
COMPLETED STUDY SUMMARY

TITLE: Analysis of Large Requisitions

IDENTIFICATION NUMBER:

IRO Project No. 220

REPORT:

"Analysis of Large Requisitions," Arthur Hutchison, IRO Final Report, February 1977, AD-A036003.

SPONSOR:

DRC Directorate for Materiel Management
Associate Director for Requirements & Resources, DRCMM-RS

PROJECT OFFICER:

Arthur Hutchison

INITIATION/COMPLETION DATES:

June 1975/February 1977

ABSTRACT:

The purpose of this study was to develop models and procedures which would effectively prevent the release of large erroneous quantities to field customers and to reduce the number of invalid rejections.

Various models were tested by screening and validating requisitions for aviation items emanating from within 1st COSCOM, Ft. Bragg, NC. Several performance indicators were used to evaluate the models: excess dollars captured; holding vs backorder costs; and erroneous requisitions filled by the NICP.

Results indicate a maximum release quantity model at both the retail and wholesale level based on a geometric distribution of the issue quantities outperformed the current DARCOM VMR model and models used by the other Services. Additionally, it was determined advantageous to release the average issue quantity as opposed to the MRQ when the MRQ value was exceeded by a customer's requisition.

MAJOR CONCLUSIONS/RECOMMENDATIONS:

Utilize the geometric issue quantity model at both retail and wholesale levels. Release the Average Issue Quantity when the MRQ is exceeded at the NICP.

IMPLEMENTATION STATUS:

A SCR has been submitted to ALMSA to implement the wholesale MRQ

Project 220 (cont)

model and to release the AIQ when the MRQ is exceeded. Results of the retail model were accepted but implementation has been delayed due to a desire for further testing on other than aviation items.

RELATED STUDIES:

"Calculations of Requisition MRQ Based on VMR of Demand,"
Chung-Mei Churn, IRO Final Report, February 1969, AD-689463.

US ARMY INVENTORY RESEARCH OFFICE
COMPLETED STUDY SUMMARY

TITLE: Use of End Item Age and Usage in Demand Forecasting

IDENTIFICATION NUMBER:
IRO Project No. 236

REPORT:
"Use of End Item Age and Usage in Demand Forecasting," Edwin Gotwals, III, and Arthur Hutchison, IRO Final Report, December 1976, AD-A037585.

SPONSOR:
DRC Directorate for Materiel Management
Associate Director for Requirements and Resources, DRCMM-RS

PROJECT OFFICERS:
Edwin Gotwals
Arthur Hutchison

INITIATION/COMPLETION DATES:
October 1974/August 1976

ABSTRACT:

This study suggests a method whereby during the initial two year demand period, the maintenance factor (MF) of each part is adjusted to reflect the general shape of the aggregate replacement curve of all the parts of the given system. This curve along with its arguments (usage rate, rolled up usage, age) appear to be dependent on the mission and/or design of the weapon system. By replacing the adjusted MF into the demand weighted forecast algorithm cited in DoDI 4140.42 a much improved forecast algorithm was derived.

Fundamental relationships between the subject variables were ascertained through statistical analysis on TAER's 2-1/2 ton truck maintenance data. These relationships were incorporated into forecasting techniques which were in turn tested against demands generated from a simulated (initially fielded) fleet. Replication of the basic analysis was performed on four alternative vehicles.

MAJOR CONCLUSIONS/RECOMMENDATIONS:

It was shown by statistical analysis that there is a relationship between the part replacement rate and the age and/or accumulated use of the end item during the two year provisioning period. It was also shown that by adjusting the MF to reflect this relationship a much improved forecast can be achieved during provisioning.

Project 236 (cont)

IMPLEMENTATION STATUS:

The results of this study will be incorporated into a future IRO study dealing with the updating of maintenance factors.

RELATED STUDIES:

1. "Demand Forecasting with Program Factors," IRO Final Report, Martin Cohen, September 1975, AD-A017858.
2. "Vehicle Average Useful Life Study for Truck, Cargo: 2-1/2 Ton, 6 x 6 M35A2," Technical Memorandum No. 164, US Army Materiel Systems Agency, Aberdeen Proving Ground, MD, October 1973.

US ARMY INVENTORY RESEARCH OFFICE
COMPLETED STUDY SUMMARY

TITLE: Rework of Economic Inventory Policy Tables

IDENTIFICATION NUMBER:

IRO Project No. 238

REPORTS:

1. "Forecasting Order and Ship Time for CONUS Depots," W. Karl Kruse, IRO Final Report (Phase 1), June 1977, AD-A041691.
2. "Revised Economic Inventory Procedure (EIP) Tables for DARCOM Depots," R.L. Deemer, IRO Final Report (Phase 2), September 1977.

SPONSOR:

DRC Directorate for Installations & Services, DRCIS-S

PROJECT OFFICER:

Robert L. Deemer

INITIATION/COMPLETION DATES:

February 1975/September 1977.

ABSTRACT:

The EIP tables of AR 710-2 are revised along with the methodology of forecasting the order-and-ship time. The operating level portion of the EIP tables is revised to reflect current (December 1975) holding and ordering costs. The reorder point is revised to reflect a new and better methodology that considers both demand and order-and-ship time variability and achieves inventory targets commensurate with budgetary limits. Revised stockage criteria tables are developed by means of a mathematical model that gives least cost stockage decisions within inventory performance constraints.

The proposed order-and-ship time forecast is a weighted average of the item's own history and the combined history of all items requisitioned from the same supplier where the weight ascribed to the individual item's experience depends on the number of observations.

MAJOR CONCLUSIONS/RECOMMENDATIONS:

One revised operating table and six reorder point tables and economic stockage tables are developed. There are six tables for six forecasted order-and-ship time values ranging from 15 to 90 days. Recommendation has been made to implement these tables at all DARCOM Depots within the SPEDEX system.

IMPLEMENTATION STATUS:

DARCOM is in process of reviewing procedures.

RELATED STUDIES:

"Inventory Costs at US Army Materiel Command Depots," R. L. Deemer, IRO Final Report, December 1975, AD-A021717.

US ARMY INVENTORY RESEARCH OFFICE
COMPLETED STUDY SUMMARY

TITLE: Budgetary Constraints on Retail Stock Levels

IDENTIFICATION NUMBER:
IRO Project No. 241

REPORT: "Retail Stockage Policies Under Budgetary Constraints," Alan Kaplan,
IRO Final Report, June 1977, AD-A041308.

SPONSOR: Office of the Deputy Chief of Staff for Logistics
Directorate for Supply & Maintenance, Supply Policy Division

PROJECT OFFICER:
Alan J. Kaplan

INITIATION/COMPLETION DATES:
May 1976/June 1977

ABSTRACT: Retail level organizations are subject to budgetary constraints. At the same time, the stockage policies under which they operate do not attempt to relate stockage quantities to funds available. Study compared cost/effectiveness of several alternatives for modifying stockage policy to conserve funds.

Alternatives were designed to conserve funds without seriously degrading operational effectiveness. Alternatives were designed to be readily implementable, at level of sophistication of unconstrained stockage policies.

MAJOR CONCLUSIONS/RECOMMENDATIONS:

It was found to be more cost effective to cut reorder points than to cut operating levels. Table relating size of reorder point cut to size of budgetary cut was developed.

IMPLEMENTATION STATUS:

Conclusions tentatively accepted by sponsor, pending comments by Major Commands.

RELATED STUDIES

Gilbert, L. E. and R. L. McNertney, "VOSL Analyser Manual," Naval Fleet Materiel Support Office, Mechanicsburg, PA, 1975.

US ARMY INVENTORY RESEARCH OFFICE
COMPLETED STUDY SUMMARY

TITLE: Budget Estimating Methodology for Out-Year Provisioning Requirements

IDENTIFICATION NUMBER:

IRO Project No. 242

REPORT:

"Bare-Bones: A Method for Estimating Provisioning Budget Requirements in the Outyears," Donald A. Orr, IRO Final Report, July 1977, AD-A044508.

SPONSOR:

DRC Directorate for Materiel Management
Associate Director for Maintenance, DRCMM-M

PROJECT OFFICER:

Dr. Donald A. Orr

INITIATION/COMPLETION DATES:

July 1976/July 1977.

ABSTRACT:

Different methodologies and procedures are currently used by Project Managers/Commodity Commands in the Army to estimate initial provisioning funding requirements early in the development cycle of a system/end item. These estimates are to project support costs 1-5 years hence; the lack of quality, uniform methodology, and defensible rationale in the estimates have concerned the Department of the Army.

Cost Estimating Relations and historical planning factors for relating provisioning costs to other variables of the end item are deemed of limited value, particularly with pending changes in the Army computational procedures for determining provisioning quantities (Standard Initial Provisioning Model - SIP). A prototype methodology is developed that reflects, early on, the quantities and costs that would be determined ultimately using SIP just prior to the deployment of the end item in the budget execution year.

This "Bare-Bones" SIP strips the computational procedure down to its essential formulae, which can be "run" off-line or manually.

An important pillar of the new procedure is a cumulative cost curve, generated from the provisioning costs of a small percentage of the total components, from which extrapolations are made of the total provisioning costs for the system. Selection of critical components is made by ranking parts by replacements per 100 end items x component unit price.

Usefulness of cost curves for extrapolating was tested on two systems - one of which had limited data on only 13 major components of the end item, but which still yielded a reasonable curve for projecting provisioning costs.

Project No. 242 (cont)

MAJOR CONCLUSIONS/RECOMMENDATIONS:

The complete guidance in the report to be used (initially for PAA budgets) by DARCOM.

IMPLEMENTATION STATUS:

BBSIP was used by the Readiness Commands for developing the September 1977 budget requests on many systems. It should reach full implementation next FY.

RELATED STUDIES:

"Repair Part/System Acquisition Cost Ratio for Safeguard ABM Budget Estimates," B. Rosenman and J. Denham, IRO Final Report, August 1970, AD-876778.

US ARMY INVENTORY RESEARCH OFFICE
COMPLETED STUDY SUMMARY

TITLE: Techniques for Forecasting Unserviceable Secondary Item Returns

IDENTIFICATION NUMBER:
IRO Project No. 243

REPORT: "Forecasting of Secondary Item Returns," Richard M. A. Urbach,
IRO Final Report, August 1976, AD-A030343.

SPONSOR:
DRC Directorate for Materiel Management
Associate Director for Requirements & Resources, DRCMM-RS

PROJECT OFFICER:
Richard Urbach

INITIATION/COMPLETION DATES:
November 1975/August 1976.

ABSTRACT:
Returns of unserviceable secondary items to the Depots for overhaul are erratic. Forecasting methods currently used give large forecast errors, causing serious difficulties in the planning and execution of the overhaul program.

A family of Return Rate models using a Kalman Filter to estimate unserviceable returns per unit of program (Flying Hours or Item Density) is examined. A comparison based on several measures of forecast error is made with the current forecasting model of unserviceable returns per unit of demand. Computer simulations with a 5-year history of AVSCOM returns and program data were used for evaluation. The current model produces forecast errors 10 to 20 percent higher than the Kalman Filter models.

MAJOR CONCLUSIONS/RECOMMENDATIONS:

1. Forecast algorithms utilizing flying hours perform better on the AVSCOM data base than strictly demand dependent algorithms.
2. Recommended technique (Kalman filter) yields substantial improvement in terms of forecast accuracy.

IMPLEMENTATION STATUS:
Model has been approved for implementation within CCSS and is awaiting programming.

RELATED STUDIES:
"Demand Forecasts Using Process Models & Item Class Parameters: Application of Ancillary Variables," Donald A. Orr, IRO Final Report, April 1976, AD-A026081.

US ARMY INVENTORY RESEARCH OFFICE
COMPLETED STUDY SUMMARY

TITLE: Over-Ocean Cargo Forecasting System

IDENTIFICATION NUMBER:
IRO Project No. 244

REPORT:
"Over-Ocean Cargo Forecasting," Robert L. Deemer and Donald A. Orr,
IRO Final Report, November 1976, AD-A034113.

SPONSOR:
DRC Directorate for Materiel Management
Associate Director for Supply & Distribution, DRCMM-S

PROJECT OFFICERS:
Robert L. Deemer
Donald A. Orr

INITIATION/COMPLETION DATES:
December 1975/November 1976.

ABSTRACT:
Presently there is no standard method of forecasting over-ocean cargo requirements within the Army. An operational analysis identified the important elements of the forecast. A set of forecasting procedures is developed for various types of cargo. The forecasts are broken down into major, special, and residue cargo forecasts and the latest information is combined with past history by use of the Kalman forecasting algorithm developed in previous IRO work.

The proposed forecast procedures make use of the Logistics Control Activity (LCA) feedback system already in operation. A monitor at the LCA is recommended who can override the computer generated forecasts when appropriate.

MAJOR CONCLUSIONS/RECOMMENDATIONS:
Major items will be forecasted by DARCOM Materiel Readiness Commands. Forecasts for secondary item movements are computer generated at LCA utilizing the Kalman forecasting technique. Automatic adjustments are made at LCA to the MRC forecasts. A human monitor at LCA provides manual adjustments to forecasts when necessary.

IMPLEMENTATION STATUS:
Systems Change Request has been written and sent to DARCOM for approval. Upon approval, LCA will have to fit this requirement into their programming schedule.

Project No. 244 (cont)

RELATED STUDIES:

1. "Forecasting Over-Ocean Transportation Requirements," Logistics Studies Office Final Report, ALMC, Ft. Lee, VA, January 1973.
2. "Demand Forecasts Using Process Model and Item Class Parameters: Application of Ancillary Variables," IRO Final Report, Donald A. Orr, April 1976, AD-A026081.

US ARMY INVENTORY RESEARCH OFFICE
COMPLETED STUDY SUMMARY

TITLE: Evaluation of Support Alternatives for COMSEC Installations Kits

IDENTIFICATION NUMBER:

IRO Project No. 247

REPORT:

"Evaluation of Procurement Alternatives for COMSEC Installation Kits," W. Karl Kruse, IRO Final Report, November 1976, AD-A032865.

SPONSOR:

USA Communications Security Logistics Agency
National Inventory Control Point

PROJECT OFFICER:

W. Karl Kruse

INITIATION/COMPLETION DATES:

April 1976/November 1976

ABSTRACT:

This study evaluates several alternative ways to obtain installation kits, IK's, for COMSEC equipment. The basic issues evaluated were: from whom should the parts be obtained; who should assemble the kits; when should IK's be assembled; and who should manage the assembly program. Costs were not available for all of the relevant factors, but, nevertheless, were the driving forces of the evaluation. The conclusions are that IK piece parts should be obtained through a competitive process and the IK's assembled at the COMSEC depot under the direct control of the Communications Security Logistics Agency. Assembly batches should be kept small.

MAJOR CONCLUSIONS/RECOMMENDATIONS:

CSLA should obtain piece parts separately from commercial sources; assemble the kits from the piece parts at the COMSEC depot in small batches; and manage the assembly program from the NICP.

IMPLEMENTATION STATUS:

All recommendations have been implemented, although presently CSLA does not assume control of the kits until after the initial procurements are made by ECOM.

RELATED STUDIES:

None.

US ARMY INVENTORY RESEARCH OFFICE
COMPLETED STUDY SUMMARY

TITLE: Requirements-Driven Repair Scheduling System for Secondary Items

IDENTIFICATION NUMBER:
IRO Project No. 250

REPORT:
"Requirements-Driven Repair Scheduling System for Secondary Items,"
Arthur Hutchison, IRO Final Report, September 1977, AD-A046579.

SPONSOR:
DRC Directorate for Materiel Management
Associate Director for Requirements and Resources, DRCMM-RS

PROJECT OFFICER:
Arthur Hitchison

INITIATION/COMPLETION DATES:
November 1976/September 1977

ABSTRACT:
The purpose of this study was to identify problem areas in the management and operation of the DARCOM system for managing Depot repair of secondary items. Emphasis is placed on reducing the repair cycle times thereby reducing Requirements Objectives and annual buys. Several short term improvement recommendations are made as result of this study. Additional problem areas are identified that cannot be corrected in the short term. These are being worked on in a follow-on study: IRO Project No. 255, Design of a Prioritized Depot Scheduling System for Secondary Item Repair.

MAJOR CONCLUSIONS/RECOMMENDATIONS:
Short term recommendations were made to automate calculation of Repair Lead Times and to develop an interim list of high budget impact items on which attention could be focused during the next budget cycle. A set of longer term recommendations involved identification of areas in which system re-design is needed.

IMPLEMENTATION STATUS:
A computer program was written at ALMSA and used by NICPs to measure actual repair times. These values were used in the FY 78 budget preparation. A list of high budget impact items was developed and short cut procedures for following them closely through the repair cycle were worked up and put into use on an interim basis.

Longer term recommendations on areas where system re-design should be done were adopted. Work on these is proceeding under IRO Project No. 255.

Project No. 250 (cont)

RELATED STUDIES:

1. Murray, B. G., "Manhour Availability Workloading System (MAWS)," Depot Systems Command, December 1976.
2. Depot Maintenance Workloading Planning with a Linear Programming Model, Major Item Data Agency, November 1975.
3. Final Report, "Management of the Overhaul Cycle in the U.S. Army," Logistics Management Institute, May 1966.

US ARMY INVENTORY RESEARCH OFFICE
COMPLETED STUDY SUMMARY

TITLE: Maintenance Float Study

IDENTIFICATION NUMBER:
IRO Project No. 251

REPORT: "Study of Army Maintenance Float Policies and Management Practices,"
Edwin Gotwals, Larry Smith, W. Karl Kruse, John Fortune, IRO Final
Report, October 1977.

SPONSOR:
DARCOM Directorate of Materiel Management
Associate Director for Maintenance, DRCMM-M

PROJECT OFFICERS:
Edwin Gotwals
W. Karl Kruse

INITIATION/COMPLETION DATES:
February 1977/October 1977

ABSTRACT:

As a result of GAO and AAA studies, considerable attention has been focused on Army policies and procedures for determining maintenance float requirements and management of float assets. A study team consisting of representatives from the Inventory Research Office (IRO), the Army Materiel Systems Analysis Agency (AMSAA), the Maintenance Management Center (MMC), and the Depot Systems Command (DESCOM) under the sponsorship of the Army Materiel Development & Readiness Command (DARCOM) developed new management concepts and computational methods designed to improve the current policies governing maintenance float.

The study methodology included (a) two sets of questionnaires, one sent to the DARCOM Major Support Commands and Project Managers and the other sent to DARCOM Field Maintenance Technicians, (b) model development to calculate repair cycle (RCF) and operational readiness float (ORF) requirements, (c) a review of existing policy and regulations and (d) the identification of potential data sources which can be used to perform float calculations and verification. The study findings resulted in 14 recommendations relating to the computation of maintenance float distribution and program requirements, and the evaluation of float levels against an objective criterion.

MAJOR CONCLUSIONS/RECOMMENDATIONS:

Innovative techniques for computing ORF and RCF distribution and program requirements were recommended, as well as policy governing its use in the field. Procedures for evaluating the effectiveness of the ORF distribution requirements were also recommended.

Project No. 251 (cont)

IMPLEMENTATION STATUS:

The study is awaiting evaluation by DA and DARCOM.

RELATED STUDIES:

1. Draft "Improvements Needed in Computing the Requirements for Spare Equipment at Army Maintenance Activities to Maintain Operational Readiness," DA (Code 9472.6) prepared by US General Accounting Office, 19 September 1976.
2. "Better Management of Spare Equipment Will Improve Maintenance Productivity and Save the Army Millions," LCO-76-442, prepared by US General Accounting Office, 5 April 1977.
3. "A Study to Determine the Cost Impact of Maintenance Floats," US Army Maintenance Management Center, Lexington, KY, April 1976.
4. Draft, "Review of Operational Readiness Float Concept," US Army Logistics Evaluation Agency, New Cumberland, PA, November 1976.
5. "Review of Operational Readiness Float Concept," US Army Logistics Evaluation Agency, New Cumberland, PA, June 1977.

US ARMY INVENTORY RESEARCH OFFICE
ONGOING STUDY SUMMARY

TITLE: Guidance for Major Items Management System

IDENTIFICATION NUMBER:
IRO Project No. 248

SPONSOR:
DRC Directorate for Plans, Doctrine & Systems, DRCPS-S

PROJECT OFFICER:
Steven Gajdalo

INITIATION/PROGRAMMED COMPLETION DATES:
May 1976/December 1977

PROBLEM:

1. An integrated and automated system for management of major items is desired but specifications for such a system are lacking.
2. Authorization data play a major role in requirements determination/distribution of major items. Errors in the data are known to exist and improvements are desired.
3. Management procedures are inadequate for major items that are assemblies of components.

OBJECTIVES:

Develop specifications for an automated and integrated system; for processing and editing authorization data; and for management and control of major items assemblages.

CURRENT STATUS:

An outline of a conceptual framework for an integrated Major Item Management System was developed. It is to be used, along with other inputs, by the DARCOM Major Items Functional Coordinating Group, which now has assumed responsibility for developing the system. Problem 2 was deleted when it was discovered that Concepts Analysis Agency was already covering much of the same ground in their Management of Change study.

A final report on problem 3 is in preparation.

RELATED STUDIES:

"Management of Change (MOC)," US Army Concepts Analysis Agency, June 1977 (revised September 1977).

**US ARMY INVENTORY RESEARCH OFFICE
ONGOING STUDY SUMMARY**

TITLE: Operational Analysis of Item Manager Decision Making

IDENTIFICATION NUMBER:
IRO Project No. 252

SPONSOR:
DRC Directorate for Materiel Management
Associate Director for Requirements & Resources, DRCMM-RS

PROJECT OFFICER:
Alan J. Kaplan

INITIATION/PROGRAMMED COMPLETION DATES:
April 1977/January 1978

PROBLEM:
Project is exploratory in nature, to see if there are areas where changes could improve item manager effectiveness.

OBJECTIVES:
Identify specific areas for improvements, and develop ideas for improving them.

CURRENT STATUS:
Questionnaires that were sent to selected item managers have been evaluated and proposals made to effect improvements. These are now being evaluated by DARCOM HQ and Materiel Readiness Commands.

RELATED STUDIES:
None

US ARMY INVENTORY RESEARCH OFFICE
ONGOING STUDY SUMMARY

TITLE: Improvement of Distribution Effectiveness

IDENTIFICATION NUMBER:

IRO Project No. 253

SPONSOR:

DRC Directorate for Materiel Management
Associate Director for Supply & Distribution, DRCMM-S

PROJECT OFFICER:

Robert L. Deemer
Alan J. Kaplan

INITIATION/PROGRAMMED COMPLETION DATES:

February 1977/February 1978

PROBLEM:

There is concern that too often requisitions are not filled from the closest area oriented depots.

OBJECTIVES:

Develop and validate procedures for modifying release of low priority backorders so that distribution effectiveness can be improved with little or no degradation to supply performance.

CURRENT STATUS:

Preliminary data analysis indicated only 33% of the backorders were presently being filled within 30 days. Further analysis also indicated 26% of the wrong depot shipments are due to backorder releases. Data is being gathered to determine the number of days until stock arrives at one depot after finding out stock has arrived at another depot.

RELATED STUDIES:

"Performance Standards for Depot Initial Fill Rates," Alan J. Kaplan, IRO Final Report, May 1972, AD-744786.

US ARMY INVENTORY RESEARCH OFFICE
ONGOING STUDY SUMMARY

TITLE: Implementation of Quantity Discount Procedures at DARCOM Materiel Readiness Commands

IDENTIFICATION NUMBER:
IRO Project No. 254

SPONSOR:
DRC Directorate for Materiel Management
Associate Director for Requirements and Resources, DRCMM-RS

PROJECT OFFICERS:
Steven Gajdalo, IRO
Eugene Beeckler, Procurement Research Office, Ft. Lee, VA
(This is a joint project with PRO)

INITIATION/PROGRAMMED COMPLETION DATES:
July 1977/September 1978

PROBLEM:

The Materiel Readiness Commands do not take advantage of the economics of quantity discounts when procuring secondary items.

OBJECTIVES:

To develop and test procedures for determining when it is economically advantageous to attempt to obtain quantity discounts in the procurement of secondary items.

CURRENT STATUS:
Fact finding at the Air Logistics Centers has been completed. Tentative procedures have been developed for DARCOM use. Legal questions related to these procedures are being investigated.

RELATED STUDIES:
"Project EOQ: Feasibility of Price Discounts in Procurement of Non-Reparable Spares," L. M. Austin, M. S. Anselmi, R. E. Carlburg and H. A. Clark, Technical Report No. 74-18, USAF Academy, Colorado, September 1974.

US ARMY INVENTORY RESEARCH OFFICE
ONGOING STUDY SUMMARY

TITLE: Improvement of Insurance Model

IDENTIFICATION NUMBER:
IRO Project No. 256

SPONSOR:
DRC Directorate for Materiel Management
Associate Director for Requirements & Resources, DRCMM-RS

PROJECT OFFICER:
Alan J. Kaplan

INITIATION/PROGRAMMED COMPLETION DATES:
August 1977/February 1978

PROBLEM:
A number of shortcomings exist in Insurance/NS02 models currently in CCSS that lead in many cases to computed quantities being too large and in some cases too small.

OBJECTIVES:
Identify all shortcomings and develop solutions which can be implemented without great difficulty.

CURRENT STATUS:
Draft SCR incorporating solutions has been developed and is being reviewed by Materiel Readiness Commands. MRC's previously reviewed list of shortcomings.

RELATED STUDIES:
Deemer, Robert L., "Test of Updating Methodologies for Insurance Items," IRO Final Report, January 1973, AD-756378.

US ARMY INVENTORY RESEARCH OFFICE
ONGOING STUDY SUMMARY

TITLE: Design of a Prioritized Depot Scheduling System for Secondary Item Repair

IDENTIFICATION NUMBER:
IRO Project No. 255

SPONSOR:
DRC Directorate for Materiel Management
Associate Director for Requirements and Resources, DRCMM-RS

PROJECT OFFICER:
Arthur Hutchison

INITIATION/PROGRAMMED COMPLETION DATES:
July 1977/January 1978

PROBLEM:
The current secondary repair system is ineffective in maintaining readiness and emphasizing reduction in inventory investment costs. Defense of the PAA budget requests is impaired since the elements of the Repair Cycle Time are not clearly defined and measured.

OBJECTIVES:
Based on problem areas identified in Project 250, a conceptual redesign of the secondary item rebuild system is to be done. Areas involved in this design will include: 7M funding; return of un-serviceable assets; data transfer between NICP, DESCOM and Depots; Requirements Determination; workloading at DESCOM; induction scheduling at Depots, Depot repair priorities. Procedures to define measure Repair Cycle Time will be expanded above those presented in IRO Project 250. Emphasis will be placed on coordinating on-going studies affecting the repair.

CURRENT STATUS:
An initial conceptual design of the secondary item repair system has been developed. Efforts are underway to coordinate this work with ALMSA's design of the Maintenance Data Management System and DESCOM's development of a telecommunication link with the MRC's.

RELATED STUDIES:
"Requirements-Driven Repair Scheduling System for Secondary Items,"
Arthur Hutchison, IRO Final Report, September 1977, AD-A046579.

US ARMY INVENTORY RESEARCH OFFICE
ONGOING STUDY SUMMARY

TITLE: Failure Factors for Contingency Planning

IDENTIFICATION NUMBER:

IRO Project No. 257

SPONSOR:

DRC Directorate for Materiel Management
Associate Director for Maintenance, DRCMM-M

PROJECT OFFICER:

Donald Orr
Edwin Gotwals

INITIATION/PROGRAMMED COMPLETION DATES:

September 1977/June 1978

PROBLEM:

Consistent methods, rationale and adequate data bases do not currently exist for obtaining failure factors (replacement rates) for components within a wartime scenario with the intensive stress and usage imposed upon the end item. Relationships between "peacetime" and "wartime" failure factors are not known and current adjustment factors have no firm basis.

OBJECTIVES:

Evaluate failure rates experienced from various combat studies and exercises for several end items. Specify procedures, data pool requirements, and test requirements for obtaining initial, heuristic factors and later, revised empirical factors for peace and war conditions.

CURRENT STATUS:

Analysis made of quality, extent, availability, and variability of data on replacement rates in combat scenarios. Current work concentrates on heuristic, implementable schemes for making reasonable estimates with little data.

RELATED STUDIES:

"New Concepts for Provisioning Parameter Estimates," D. A. Orr,
IRO Technical Reports 77-3, 77-4, December 1976, AD-A034589 and
A034585.

US ARMY INVENTORY RESEARCH OFFICE
ONGOING STUDY SUMMARY

TITLE: War Reserve Requirements for New Weapon Systems

IDENTIFICATION NUMBER:
IRO Project No. 258

SPONSOR:
DRC Directorate for Plans, Doctrine and Systems, DRCPS

PROJECT OFFICER:
Bernard B. Rosenman

INITIATION/PROGRAMMED COMPLETION DATES:
September 1977/June 1978

PROBLEM:
Heretofore War Reserve requirements have not been developed for new weapon systems until they have actually been deployed. It is desired, however, to estimate what these requirements will be for budgetary purposes far in advance of that time.

OBJECTIVES:
To develop a procedure for estimating War Reserve budgetary requirements for new weapon systems that are scheduled for deployment in the POM/FYDP period. The procedure must be capable of use during early phases of weapon system development when data on expected failure rates, maintenance support planning, etc., are only partially available.

CURRENT STATUS:
Use is to be made of the Bare Bones Standard Initial Provisioning (BBSIP) model for this purpose. Modifications have been made to the BBSIP procedure to suit this application and a preliminary analysis has been run on the XMI Tank. Briefings on the concept are to be given to DARCOM, DA and OSD (December 1977) before an implementation package is developed.

RELATED STUDIES:
"Bare Bones: A Method for Estimating Provisioning Budget Requirements in the Out-Years," Donald A. Orr, IRO Final Report, July 1977, AD-A044508.

US ARMY INVENTORY RESEARCH OFFICE
LOGISTICS MANAGEMENT ASSISTANCE

In addition to its formal work program, the IRO provides assistance upon request to DARCOM Headquarters and its subordinate commands and, occasionally, to other DoD activities on problems of a short term nature. These problems generally require only a couple of man weeks of effort. Some of the tasks worked on during FY 7T and 1977 are described below:

EOQ/VSL Fix-Ups - Problems in CCSS were causing alternating buys and cutbacks. The causes of most of these problems were found and corrected; some, however, remain to be implemented in CCSS and a few were found to require longer-range study.

Evaluation of ROOST Proposals - IRO furnished a representative on the Technical Evaluation Board in selection of a contractor for DCSLOG sponsored study on Requirements Objectives/Order and Ship Times. A member of the IRO staff also serves on the SAG for this contract.

Functional Coordinating Group - IRO furnishes members for the FCGs on Supply Management, Initial Provisioning, Maintenance Management and Major Items. Development of quick fixes and assisting in evaluation of System Change Requests is occasionally involved.

RIMSTOP - DCSLOG asked the US Army Logistics Center to conduct an independent evaluation of the OSD RIMSTOP (Retail Inventory Management Stockage Policies) Work Group recommendations. Assistance was furnished to the Logistics Center by computing stockage tables for their simulation runs and by furnishing advice and assistance as requested during the course of their simulation experiments.

Special Program Requirements - Assistance was given to DARCOM in conjunction with negotiations with Defense Logistics Agency on how to handle depot maintenance requirements for DLA parts.

Frankford Arsenal Closure - Advice was given on how (and how not) to PERT Frankford Arsenal closure actions to assure that all steps were taken in proper sequence and as required to meet closure dates.

US ARMY INVENTORY RESEARCH OFFICE
INTERNAL RESEARCH PROJECTS

The IRO conducts, on a continuing basis, internally general research designed to advance the state of the modelling art in areas where theoretical advances are needed for the development of improved models suitable for early implementation in the Army logistics system. Much of this effort centers on extension of inventory theory necessary to meet conditions found in Army logistics. Work done under this program in FY 77 and 1977 is reported in the following:

"Heuristic Interpretation of Analysis of Covariance," Edwin Gotwals III, December 1976, AD-A034114.

"Inventory Average Costs: Non-Unit Order Size and Random Lead Times," Richard Urbach, March 1977, AD-A040906.

"(R,Q) Inventory Problem with Unknown Mean Demand and Learning (A Sequel)," Alan J. Kaplan, September 1977, AD-A045210.

A good deal of work is also carried on to develop and maintain a data basis that is used in support of the over-all work program. In the past year, the Aviation Systems Command data base was expanded to cover demand and return transactions over the 10-year period 1966-75. Flying hour data by aircraft system are also maintained over the same period. Work was also begun to reduce 4 years of similar data from the Missile Readiness Command. These data are used in conjunction with the IRO DoDI 4140.39 simulation in the development and evaluation of forecasting and inventory management models.

US ARMY INVENTORY RESEARCH OFFICE
PROFESSIONAL ACTIVITIES

Papers published in technical journals, participation in meetings of professional societies and in management activities of the societies are reported here.

Technical Papers

"(R,Q) Inventory Problem with Unknown Demand and Learning," Alan J. Kaplan, Naval Research Logistics Quarterly, 23, No. 4, 687-95, December 1976.

"A Note on EOQ Under Fund Constraints," Alan J. Kaplan, Naval Research Logistics Quarterly (to be published).

"More on Simon's Two Echelon Model," W. Karl Kruse, Journal of the Operations Research Society of America (to be published).

"Forecasting Demand from Process Models Using Kalman Filters and Class Parameters," Donald A. Orr, Management Science (to be published).

Papers Presented and Other Activities at Society Meetings

"Problems of Translating Inventory Models into Practice," Bernard B. Rosenman (Session Chairman), Joint National ORSA/TIMS Meeting, Miami, FL, November 1976.

"Gauging the Benefits of Management Information Systems," Bernard B. Rosenman (Panel Member), Joint National ORSA/TIMS Meeting, Miami, FL, November 1976.

"Logistics Constraints and Military Operations," Bernard B. Rosenman, 38th Military Operations Research Sumpoium, December 1976.

"Quantifying the Intangible Benefits of Management Information Systems," Bernard B. Rosenman (Session Chairman), Joint National ORSA/TIMS Meeting, San Francisco, CA, May 1977.

"Provisioning Budgets in the Out-Years," Donald A. Orr, 39th Military Operations Research Symposium, US Naval Academy, Annapolis, MD, June 1977.

"Contributions of Management Science and Operations Research to Management Information Systems," Bernard B. Rosenman (Session Chairman) and "Decision Dilemmas in Advanced Management Information Systems" (Paper), XXIII International Meeting of TIMS, Athens, Greece, July 1977.

Professional Affairs

Mr. Rosenman was appointed Chairman of the Geographical Sections Committee of the Operations Research Society of America. This office has a 1 year term, ending in May 1978.

Other Professional Activities

Lectures were given by Mr. Rosenman in graduate inventory theory courses and at graduate industrial engineering seminars at Cornell University in November 1976. These lectures were on IRO work in evaluating and adapting advanced models for implementation within the Army. He also lectured at the Naval Post Graduate School in May 1977 on quantitative models that have been implemented by the Army in the initial provisioning process.

US ARMY INVENTORY RESEARCH OFFICE
REPORTS

The IRO Annual Report for FY 1975/1976 listed all reports published and distributed in the period June 1971 - June 1976. The following reports were published in the period July 1976 - September 1977.

"Kalman & Moving Average Filters for Forecasting: Systematics of Demand Processes and Extensions," Donald A. Orr, Technical Report, October 1976, AD-A032496.

"Evaluation of Procurement Alternatives for COMSEC Installation Kits," W. Karl Kruse, Final Report, November 1976, AD-A032865.

"Over-Ocean Cargo Forecasting," Robert L. Deemer and Donald A. Orr, Final Report, November 1976, AD-A034113.

"Heuristic Interpretation of Analysis of Covariance," Edwin Gotwals III, Technical Note, December 1976, AD-A034114.

"New Concepts for Provisioning Parameter Estimates: Part I: Maintenance Factors and Replacement Rates," Donald A. Orr, Technical Report, December 1976, AD-A034589.

"New Concepts for Provisioning Parameter Estimates: Part II: Task Distributions and Washout Rates," Donald A. Orr, Technical Report, December 1976, AD-A034585.

"Use of End Item Age in Demand Forecasting," Edwin Gotwals III and Arthur Hutchison, Final Report, December 1976, AD-A037585.

"Analysis of Large Requisitions," Arthur Hutchison, Final Report, February 1977, AD-A036003.

"Inventory Average Costs: Non-Unit Order Size and Random Lead Times," Richard Urbach, Technical Report, March 1977, AD-A040906.

"Impact of Implementation of DoDI 4140.39 at Army Inventory Control Points," Robert L. Deemer, Final Report, April 1977, AD-A039830.

"Retail Stockage Policy Under Budget Constraints," Alan J. Kaplan, Final Report, June 1977, AD-A041308.

"Forecasting Order & Ship Time for CONUS Depots," W. Karl Kruse, Final Report, June 1977, AD-A041691.

"Bare Bones: A Method for Estimating Provisioning Budget Requirements in the Outyears," Donald A. Orr, Final Report, July 1977, AD-A044508.

"R,Q Inventory Problem with Unknown Mean Demand and Learning (A Sequel)," Alan J. Kaplan, Technical Report, September 1977, AD-A045210.

"Requirements-Driven Repair Scheduling System for Secondary Items," Arthur Hutchison, Final Report, September 1977, AD-A046579.

"Revised Economic Inventory Procedure (EIP) Tables for DARCOM Depots," Robert L. Deemer, Final Report, September 1977.

"Study of Army Maintenance Float Policies and Management Practices," Edwin Gotwals and W. Karl Kruse (IRO), Larry Smith (AMSAA), and John Fortune, MMC, Final Report, September 1977.

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